

Logic Programming Engineering – Assignment 8

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Exercise 8.1 [Fibonacci numbers revisited]

- a) Declare a dynamic predicate `cachedfibonacci/2` (cf. `dynamic/1`) which serves to compute the n -th Fibonacci number. This time, the goal is to store the result of a computation of F_n in memory and make it available for future computations to avoid costly re-computations.

To do so, write `cachedfibonacci/2` as wrapper that 1) calls the implementation of the predicate `fibonacci/2` from Exercise 2.3a and 2) inserts the result to the cache via `asserta/1` on the dynamic predicate `cachedfibonacci/2`.

- b) Provide a modified version of the predicate `fibonacci/2` called `fastfibonacci/2` such that no Fibonacci number is computed more often than once.
- c) Evaluate the performance of the different implementations by using the SWI-profiler (cf. `profile/1`). Do not forget to empty the cache (cf. `retractall/1`) between two profiling runs.

Solution:

- a) `:- dynamic cachedfibonacci/2.`

```
cachedfibonacci(N,FN) :- fibonacci_simple(N,FN),  
                           asserta(cachedfibonacci(N,FN):-!).
```

```
fibonacci_simple(0, 1) :- !.  
fibonacci_simple(1, 2) :- !.  
fibonacci_simple(N,FN) :-  
    N >= 2,  
    N1 is N-1,  
    N2 is N-2,  
    fibonacci_simple(N1, FN1),  
    fibonacci_simple(N2, FN2),  
    FN is FN1+FN2.
```

- b) `:- dynamic(memory/2).`

```
cached_fibonacci(N,FN) :- retractall(memory(_,_)),  
                           fibonacci(N,FN).
```

```
fibonacci(0,1) :- !.  
fibonacci(1,2) :- !.  
fibonacci(N,FN) :- memory(N,FN), !.
```

```
fibonacci(N, FN) :-  
    N >= 2,  
    N1 is N-1,  
    N2 is N-2,  
    fibonacci(N1, FN1),  
    fibonacci(N2, FN2),  
    FN is FN1+FN2,  
    assert(memory(N, FN)).
```

Exercise 8.2 [Efficiency]

Download the Prolog solution files `eratosthenes.prolog`, `fibonacci.prolog`, and `nqueens.prolog` from the tutorials website. Extract the key ideas behind the different solutions and evaluate them by using the SWI-Prolog profiler (cf. `profile/1`).

Solution: no solution provided